Special Sessions at IGARSS 2003

An Earth Science Vision:

Understand and Protect Our Home Planet
An International Challenge.

The NASA Office of Earth Science is sponsoring two sessions for the upcoming IGARSS 2003 meeting to be held in Toulouse, France during the week of July 21-25, 2003. The sessions are based on NASA's Earth Science Vision's science goals over the next 20 years (See Background Attached) and on the new technological challenges to realize this global vision. The sessions highlight the need for broad international and multi-agency collaboration to enable these capabilities.

Monday July 21, 2003 - Afternoon
Session 1:

An Earth Science Vision: Global Understanding of the Complexities of Our Planet

Chair: Gran Paules **Co-Chair: International Scientist**

This session will introduce the Earth Sciences Model concept for developing interdisciplinary and innovative scientific knowledge capabilities that will lead to new understandings of the complete Earth system and the creation of a predictive Earth system model. A series of invited papers will highlight the major scientific challenges including all components of the Earth system—the atmosphere and ocean, the solid Earth, the biosphere, and all the interactions. An overview presentation will introduce the Earth system model concept. Science topic-specific papers that provide focused implementation opportunities and highlight specific science challenges will follow this. The Session will close with commentary from a panel of international space program leaders and managers.

1. Earth System Model: *The potential for predicting future variability and change in the Earth environment using Earth System Modeling*

AUTHOR:	Mark Schoeberl	NASA, Goddard Space Flight Center
	Peter Hildebrand	NASA, Goddard Space Flight Center
	Warren Wiscomb	NASA, Goddard Space Flight Center
	Ricky Rood	NASA, Goddard Space Flight Center
	Robert Ferraro	NASA, ESTO Jet Propulsion Laboratory
	Martin Mlynczak	NASA, Langley Research Center
	Carol Raymond	NASA, Jet, Propulsion Laboratory
	David Peterson	NASA, Jet, Propulsion Laboratory
	Tim Miller	NASA, Marshall Space Flight Center
	Rick Miller	NASA, Stennis Space Center
	Mariann Albjerg	NASA, ESTO/GSFC
	Jack Kaye	NASA, Headquarters
	Granville Paules	NASA, Headquarters

2. Ocean & Atmosphere: *Predicting monthly to seasonal climate variability, and the oceanic and atmospheric causes and effects.*

AUTHOR:	Martin Mlynczak	NASA, Langley Research Center
	Tim Miller	NASA, Marshall Space Flight Center
	Mark Schoeberl	NASA, Goddard Space Flight Center
	Siegfried Schubert	NASA, Goddard Space Flight Center
	TBD	International

3. Biosphere: *A longer decadal vision for predicting biosphere-climate interactions, the availability of fresh water under the influence of climate change, and the effects of human influences.*

AUTHOR:	David L. Peterson	NASA Ames Research Center
	Rick Miller	NASA, Stennis Space Center
	Martin Mlynczak	NASA, Langley Research Center
	TBD	International

4. Solid Earth: *Predicting solid Earth - climate interactions and the effects on habitability of Earth.*

AUTHOR:	Carol Raymond	NASA, Jet Propulsion Laboratory
	Ben Chao	NASA, Goddard Space Flight Center
	Waleed Abdalati	NASA, Headquarters
	Marty Mlynczak	NASA, Langley Research Center
	TBD	International

5. Climate Change and International Policy: *International policy implications of our new understanding of the causes and effects of climate variability and change.*

AUTHOR:	Michael J. Prather	UCI
	TBR Joyce Penner	UMICH
	Being negotiated	World Class Academician
	TBD	International

Break:

PANEL Session: International and Interagency Cooperative Development: *Cooperative development of architectures for Earth system observational systems and modeling capabilities.*

The Earth System Model (ESM) provides a fundamental new ability to understand the Earth and the complex relationships between humans and the Earth environment. Due to the size and complexity, the ESM is a quintessentially international effort that includes new observational, modeling and computational capabilities, as well as the architectures that allow the observations and science algorithms to be implemented in the ESMs. The panel will discuss national and international viewpoints concerning the approaches to definition the objectives and architectures that will lead to attainment of the ESM predictive goals.

(G. Paules: convener)

Invited Panelists: (each will provide opening comments)

Earth Science Enterprise	**NASA, USA**
Representative	**CSA, Canada**
-	**ESA, Europe**
-	**NASDA, Japan**
TBR Jeffrey D. Sachs	**Columbia University**
-	**CEOS**
-	**WMO**
-	**IPCC**
-	**World Bank**

Tuesday July 22, 2003 - Morning - Preference

Session 2:

Technology Architecture Challenges to Inspire the Next Generation of Explorers

Chair: Mariann Albjerg **Co-Chair: J.C. Duh**

This session focuses on technical aspects of mid-to-future-term architectures needed for the Earth System Model (ESM). The session address the complex international challenges, the global observational and modeling needs, and the need for international cooperation in meeting these challenges. Session papers will include examples of planned and future technological capabilities that provide solutions enabling the ESM. They will also describe new remote sensing technologies that will provide crucial measurements required by Earth Scientists to better understand our home planet and to accurately model the integrated behavior of all the Earth systems—the atmosphere and ocean, the solid Earth, the biosphere, and all the interactive Earth processes.

1. An International Global Earth Observing System; system requirements and approaches to system architecture.

The vision of a future capability to predict the Earth environment based on an Earth Systems Model assumes global observational capabilities that extend well beyond the present. This paper summarizes the observational requirements in terms of the needed system of measurements and the precision, spatial and temporal resolution that will be required to meet these needs. Some approaches to developing an acceptable, international system architecture will be discussed.

AUTHOR:	Peter Hildebrand	NASA, Goddard Space Flight Center
	Mark Schoeberl	NASA, Goddard Space Flight Center
	Warren Wiscomb	NASA, Goddard Space Flight Center
	Martin Mlynczak	NASA, Langley Research Center
	Carol Raymond	NASA, Jet, Propulsion Laboratory
	Robert Ferraro	NASA, Jet, Propulsion Laboratory

	Shahid Habib	NASA Goddard Space Flight Center
	Ricky Rood	NASA, Goddard Space Flight Center
	Mariann Albjerg	NASA, ESTO/GSFC
	Jack Kaye	NASA, Headquarters
	Granville Paules	NASA, Headquarters

2. The emerging need for measurements from non-low earth orbit vantage points.

AUTHOR:	Mark Schoeberl	NASA, Goddard Space Flight Center
	Carol Raymond	NASA, Jet, Propulsion Laboratory
	Peter Hildebrand	NASA, Goddard Space Flight Center

3. The Advantages of New Vantages for Earth Science: *Earth Observation Mission Vantages: Options and Analysis.*

AUTHOR:	Gordon Johnston	NASA, Headquarters
	TBD	International

4. 20,000 Leagues under the Sea: *A journey to the future of observing the deep oceans.*

AUTHOR:	Waleed Abdalati	NASA, Headquarters
	Bill Emery	NASA, Headquarters
	TBD	International

5. Living on a Restless Planet: *Solid Earth Science in the 21st Century*

AUTHOR:	Carol Raymond	NASA, Jet Propulsion Laboratory
	Jeff Booth	NASA, Jet Propulsion Laboratory
	John LaBrecque	NASA, Headquarters
	TBR Sean Solomon	Carnegie Institution of Washington
	TBR Mary Lou Zoback,	USGS

6. The forest, the fly and the virus: *The challenge of viewing the global ecosystem from space.*

AUTHOR:	Robert Venezia	NASA, Headquarters
	David Peterson	NASA AMES
	Louisa Beck	NASA, Ames Reserch Center
	Jim Tucker	NASA, Goddard Space Flight Center

7. Smart Data Node in Space: *Approaches to architecture for the Earth System Model data processing and communications system.*

AUTHOR:	Faiza Lansing	California Institute of Technology, JPL
	Anil Kantak	California Institute of Technology, JPL

8. The Earth System Model – *Computational Technologies Required to Enable Us to Predict our Planet's Future*

AUTHOR: Robert Ferraro ESTO, Jet, Propulsion Laboratory
Cecelia Deluca ESMF Project/NCAR
Eric Guilyardi PRISM Project/Univ of Reading
Tetsuya Sato Earth Simulator Center

9. Application of Earth System Model Knowledge in the 2025 Era*: Responding to Earth system problems before they happen.*

AUTHOR: Roger L. King NASA, Headquarters

10. Earth Remote Sensing Technologies in the Twenty-First Century

AUTHOR: Jonathan Hartley NASA ESTO

11. Observational architectures for enabling earthquake forecasting

AUTHOR: Carol Raymond NASA, Jet Propulsion Laboratory
Soren Madsen NASA, Jet Propulsion Laboratory
Curtis Chen NASA, Jet Propulsion Laboratory
Wendy Edelstein NASA, Jet Propulsion Laboratory
Jeff Booth NASA, Jet Propulsion Laboratory

12. Earth Science Futuristic Trends and Implementing Strategies

AUTHOR: Shahid Habib NASA Goddard Space Flight Center

Attachment:

An Earth Science Vision:

Understand and Protect Our Home Planet
An International Challenge.

Background

The Earth is our home. The health and sustainability of the global population depends on informed decisions concerning planetary stewardship. Recognizing our scientific and social responsibility to improve life here on Earth, drives a major, long-range priority for the Earth Science to develop an accurate and quantitative predictive capability for the Earth environmental system. NASA is in a unique position to lead the development of this highly complex and large scale modeling capability where joint international science requirement drivers will require a strong commitment and involvement of national and international agencies.

The demand for developing interdisciplinary and innovative scientific knowledge and technological capabilities with new understandings of the complete Earth system will

lead to the creation of the predictive Earth model for all components of the Earth system—the Atmosphere and Ocean, the Solid Earth, the Biosphere, and all the links and between these system components. This Earth System Model will challenge the global community to develop new and innovative technological capabilities that enable highly informed social and policy decisions. International understanding of our home planet complexities will enable the protection of the global community and inspire the next generation of explorers to open up the universe.

Six major Earth science issues emerged as interdisciplinary challenges that lend themselves to predictive capability through modeling.

Oceans and Atmosphere:

-Short-term climate prediction -- on monthly to seasonal scales,

-The predictability of extreme weather -- specifically topical storms,

Solid Earth:

-Sea level under the influence of the changing climate,

-Understanding and predicting Earth crustal deformation, especially earthquakes and volcanoes,

Biosphere:

-The availability of water under the influence of climate change,

-Biosphere-climate interactions and human influences

They were chosen for their challenge to an international society for scientific breakthroughs, the needed technological advancements, and the application of the new knowledge to human social impact. These three areas of impact—science, technology and application—are important drivers for the future generations of explorers.